POPULAR MECHANICS

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TELLS YOU HOW TO DO THINGS. WRITTEN SO YOU CAN UNDERSTAND IT

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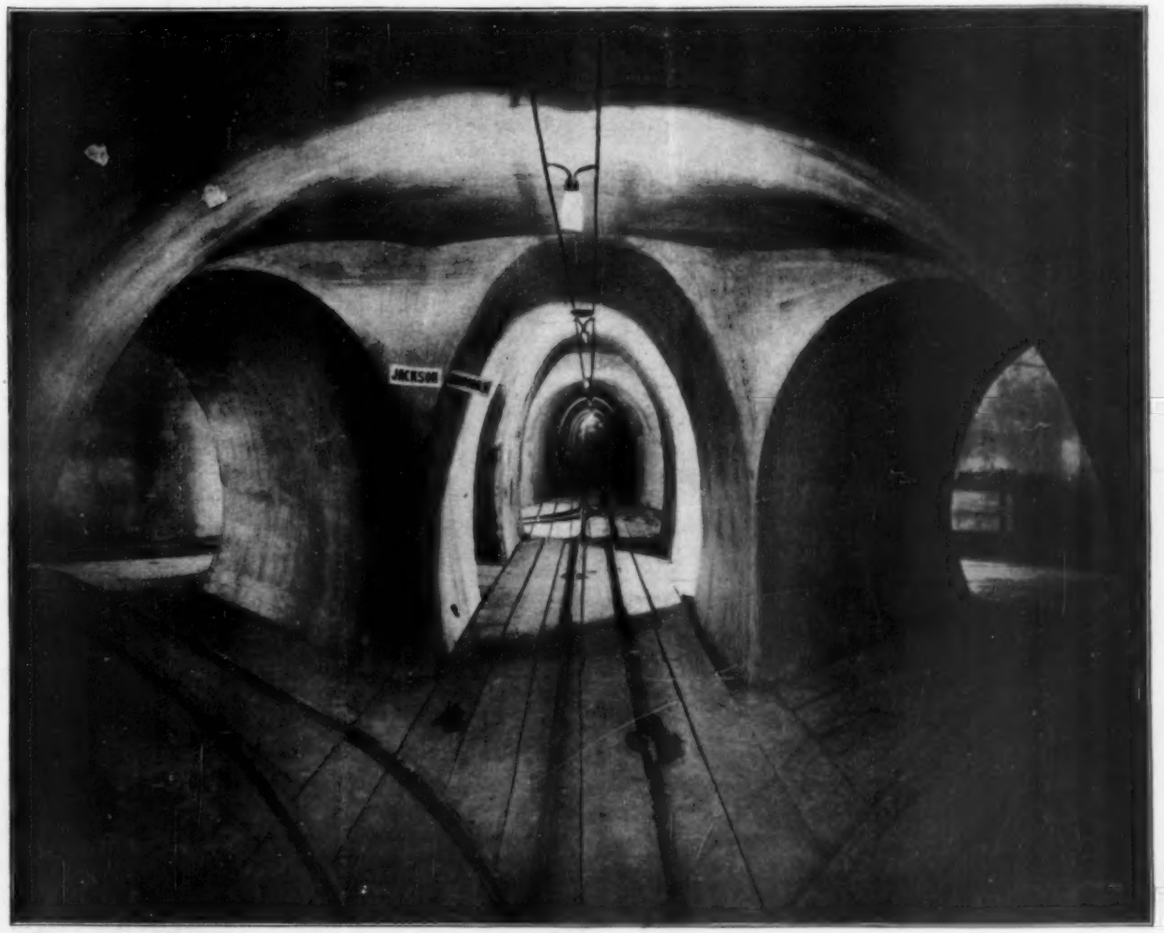
Secretly Built Tunnels Undermine Chicago



Intersection of Subways--100 Miles Now Being Built

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MAY 14 1902

How Chicago Was Undermined While the City Slept

Western Metropolis Awakes to find a Great Tunnel System Has Been Secretly Built Under Her Busy Thoroughfares

Chicago, the "wide-awake" city, whose inhabitants "never sleep," read in wonderment of the great underground tunnels being built in New York and Boston; pictures illustrating the grand engineering feats of these tunnels were viewed with admiration, and the next morning Chicago awoke to find that every one of her own business streets had been tunnelled with the greatest underground subway in the world.

When was it done? How was it done? were questions the high municipal dignitaries asked in astonishment. The entire city was bewildered. It has not recovered yet. People had passed along the streets as usual; the same throngs had crowded the retail districts and no one had noticed anything unusual. No one, not even the mayor, dreamed that the very heart of the city was being catacombed with a veritable net of subterranean passages underneath every important street. When Chicago finally recovers her breath she will find that 100 miles of these tunnels have been constructed.

Not from the windy city, not from the 'hurrying" western metropolis did the enterprise come that built this mammoth and remarkable tunnel system. From far away New Mexico and from two small towns in the east four quiet individuals with money slipped into the "windy" city and while it was "windying" so hard and so loud that it could hear nor see nothing that was going on beneath the surface, undermined the whole metropolis.

"And this was while I am Mayor," said Carter Harrison, "and while we are aldermen," said Hinky Dink and Bath House John. "What if they had been Spaniards and we were yet at war with Spain? They might have blown up the city and everybody in it and we would never have known anything about it until we and the skyscrapers and the stockyards and the packing houses were heaped in a pile of riven ruin together." And then there was the Bell Telephone Company, which heretofore has as carefully guarded Chicago—its field of prey—as the lion guards its food-stocked den to see that no rival come within its bounds, to even get a smell of the luxurious monopoly it was enjoying.

Two years ago the Illinois Telegraph & Telephone Company quietly obtained a franchise to construct an underground telephone service in Chicago. Some thought the franchise was made ineffective by the insertion of a clause forbidding the company to tear up a foot of pavement or to disturb the surface of the streets in any way under penalty of forfeiture of its entire plant. Nearly all had forgotten about the franchise, excepting the men who toiled away night and day under Chicago's streets, when not long ago a man rushed breathlessly into Mayor Harrison's office and told him that he had discovered that there were tunnels under every street in Chicago. "Impossible," said the mayor. "Who could have done it?" The man took him down under Chicago and showed him, and then Mr. Harrison called to mind the franchise, granted two years before. "But that franchise provided that not a foot of pavement should be disturbed, and somebody has got himself in trouble." But further investigation proved that sure enough the tunnel had been built without removing any of the pavement or giving noticeable outward sign of the work in progress underground. The dirt had been carried away through holes in alleys in the night time.

Those who are furnishing money for the enterprise are C. B. Eddy, of Alamagordo, New Mexico; C. D. Simpson and T. H. Watkins of Scranton, Pa., and J. B. Russell of Wilkesbarre, Pa. They are investing $10,000,000 in the work and have got twice that much more to spend when required. Not a cent has been asked from the citizens of Chicago. No bonds or stocks have been or will be offered for sale. The tunnels are to be used as conduits for the cable and wires of the new telephone company; for cars in the delivery of mail from the central postoffice to substations; for the carrying of newspapers from the newspaper offices to the outer districts; for the delivery of packages of merchandise from the big down-town stores to the outlying districts, and for many other purposes. They will serve to greatly relieve the congested condition of the down-town streets. The tunnels are forty feet beneath the surface and their extreme depth, it is claimed, will prevent their being used for an underground street railway system for passenger traffic.

For the principal business streets the tunnels are 12 by 14 feet, while in outlying districts they are 6 by 8 feet. They are as dry as the surface and follow the center line of the street. At street intersections sign boards are placed corresponding to those on the surface. Thus one may walk for miles along the electric lighted caverns with the same certainty of location as on the street above. Construction has been pushed night and day. Instead of brick walls, the floor, sides and roof are made of concrete, which is held in place by wooden forms until hard. As fast as two feet are excavated the retaining walls are built. To prevent water coming in during the excavation the tunnels are made air tight and big pumps constantly maintain a high air pressure. As fast as earth is dug it is loaded into cars and run back on side tracks. Late at night these cars are drawn to the foot of a shaft and lifted on an elevator and emptied into wagons. These loading towers are located in obscure alleys and present no sign of life during the day. About midnight they suddenly spring into action; lights blaze, cages rapidly rise, unload and descend, while an endless procession of wagons coming in at one end of the alley, depart at the other. A wagon is loaded to its fullest capacity every two minutes. With the greatest precision and activity this work continues until 5 a. m. Then suddently the lights are extinguished, the last wagon rolls away, the doors of the tower close and shut it in, the elevators stop, and all signs of life vanish. Meanwhile at another elevator, supplies of cement crushed stone and sand have been pouring down a 24-hours' supply of construction material. The concrete is mixed in long machines driven by electric motors. The men working at the ends of the tunnels are changed at frequent intervals for rest, as the work is not only hard but is pushed with all possible energy.

Had these tunnels been constructed 15 years ago they would have made an estimated saving of a million dollars a year spent in tearing up pavements to bury pipes and wires. The telephone system to be installed will be operated without any exchange. When you want a connection you set a dial to the number desired and if the telephone wanted is busy you get a signal; if not you engage in conversation without the annoyance and liability to mistakes which attend calling through an exchange, as at present.

NEED HAVE NO FEAR OF SIBERIAN WHEAT.

A practical grain man who has just returned from Siberia, says the Grain Dealers' Journal, is convinced that if that country did produce a large crop of wheat it will take years to provide the machinery and intelligent men to harvest and market it. This, it is said, may serve to pacify those who have manifested alarm at the enormous wheat fields of India, Russia, Australia, Argentine and Siberia, and who fear that American wheat will some day be crowded out of foreign markets by the surplus of Siberia.

RIFT IRON TANKS WHILE OPERA GOES ON.

Electricity Is Used in the Work and Singers Are Not Disturbed.

To avoid disturbing a performance of the grand opera at the Auditorium in Chicago, an electric arc was made to perform the functions of hammer and chisel in cutting up four large wrought iron tanks for removal from the Auditorium building. There were a number of music and dramatic schools in the Auditorium building also, but the huge iron tanks were cut into small pieces and hauled down the elevators without disturbing any one. The work progressed almost noiselessly and with wonderful rapidity.

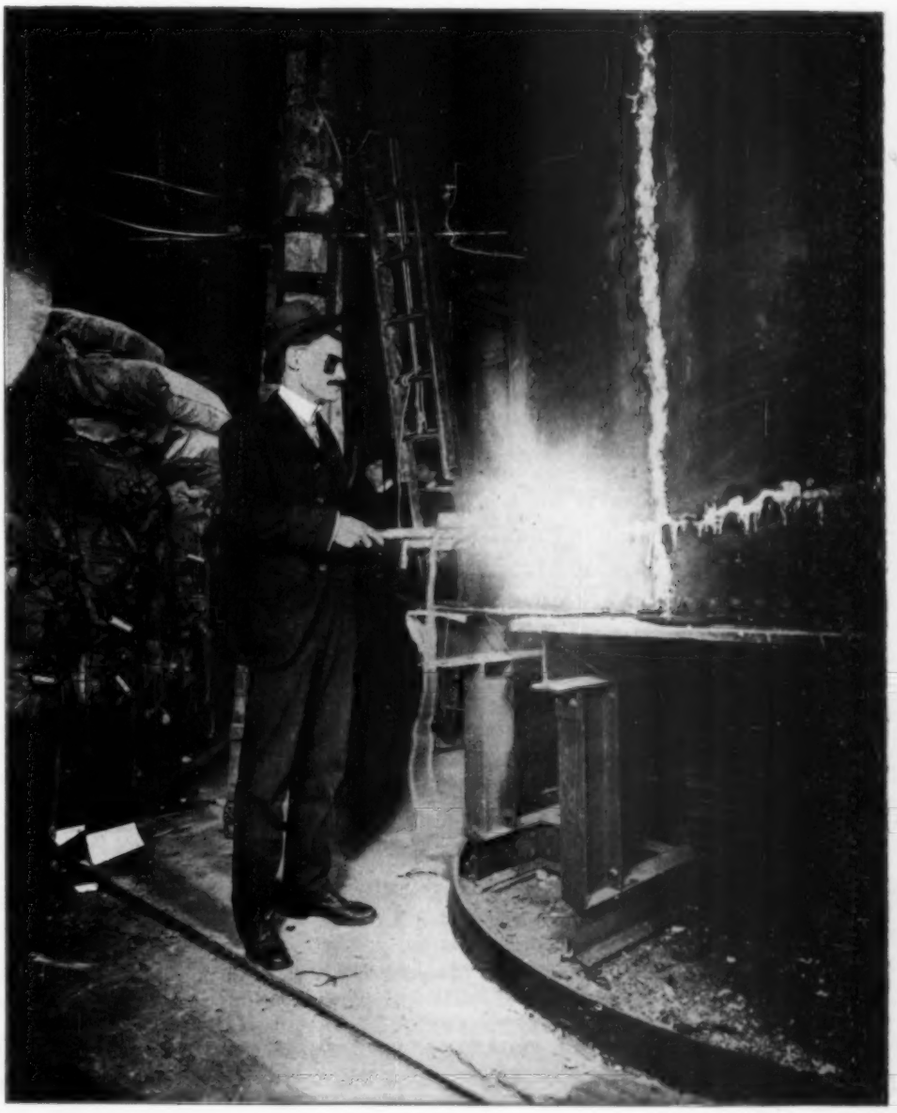
The four tanks were each 12 feet high and 24 feet in circumference. They were located on the fifteenth floor of the Auditorium tower. They were installed there many years ago when hydraulic elevators were in use. For ten years, during which time the elevators have been operated by steam equipment, the tanks have been useless.

The electric arc was used to cut the iron shells into small transportable pieces that they might be carried down the elevators. The operation was conducted by Contractor J. E. Haschke. It was by the same process as was employed in removing a "salamander" from a blast furnace in Buffalo, mentioned in Popular Mechanics, Feb. 8, when a light of 308,000 candle power, the strongest artificial light ever known, was produced. In this Buffalo operation all who looked at the light were blinded temporarily and some suffered the greatest agony for days after. In describing the cutting of the iron tanks at the Auditorium the Western Electrician says:

"The wiring feeder in the tower is tapped and the 110-volt direct current is reduced to 30 volts by a special chemical resistance or voltage reducer of Mr. Haschke's invention. Only about 75 or 80 amperes of current were used.

"One terimnal of the electric circuit was attached to the tank and the other to the carbon, the later being held by a suitable handle. The metal was melted at a white heat by the arc formed between the metal and the carbon. The arc was about 2½ or 3 inches in length, and after it penetrated the shell the molten metal squirted to a distance of 15 inches on account of the intense heat of the arc. A shell was cut at the rate of one foot in two minutes. In cutting 465 running feet of the tank, only two carbons, costing 25 cents each, were required."

"It is easy enough to be pleasant
When life flows along like a song:
But the man worth while
Is the one who will smile
When everything goes dead wrong."
—Ella Wheeler Wilcox.



Cutting up Iron Tanks with the Electric Arc.

TREATMENT OF BURNS.

In treating burns of a serious nature, the first thing to be done after the fire is extinguished is to remove the clothing. The greatest care must be exercised, as anything like pulling will bring the skin away, too; so, if the clothing is not thoroughly wet, be sure to saturate it before attempting to remove it, says Health.

If portions of clothing will not drop off, allow them to remain. Then make a thick solution of common baking soda and water, dip soft cloths in it and lay them over the injured parts, and bandage them lightly to keep them in position. Have the solution by you, and the instant any part of a cloth shows signs of dryness, squeeze some of the solution on that part. Do not remove the cloth, as total exclusion of the air is necessary, and little, if any, pain will be felt as long as the cloths are kept saturated. This may be kept up for several days, after which soft cloths dipped in oil may be applied, and covered with cotton batting. If the feet are cold, apply heat and give hot water to drink, and if the burns are very serious send for a doctor as soon as possible. The presence of pain is a good sign, showing that vitality is present.

A STRONG ELEMENT OF SUCCESS.

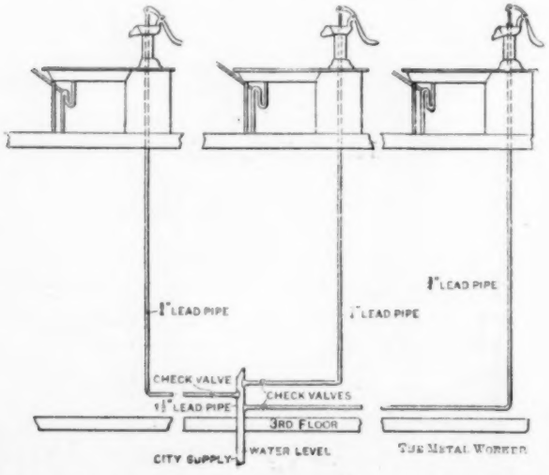
The other day I wandered into the president's office of a great industry which had been built up on honor, by strict integrity, and by absolute caution, from nothing to millions of dollars, says a writer in American Thresherman.

One of the first things I read on the table before me were these lines, which have been the watchword and password of the business:

"If your lips, you'd keep from slips,
Of these five things beware,
Of whom you speak, to whom you speak,
And how and when and where."

MULTIPLE PUMP CONNECTION.

On account of low pressure in the water mains the owner of a large private dwelling in New York found difficulty in getting water on his top floor. To save expense of steam pump and tank he put in hand pitcher pumps connected with ¾-inch



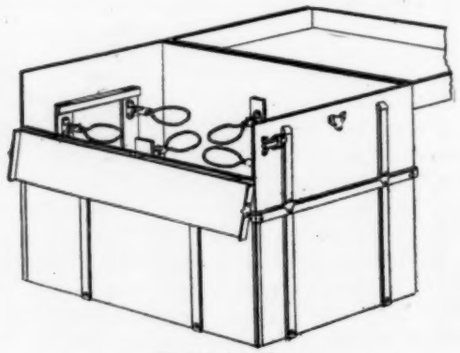
branches to the 1½-inch supply pipe on the third floor, to which point the water rose. The Metal Worker, in describing the installation, says it was found necessary to insert check valves to prevent one pump drawing air from the others. When this was done the arrangement worked nicely, as there was always water in the pipes above the check valves.

BIG STEEL PLANT FOR CHICAGO.

The United States Steel corporation will build a huge plant in Chicago, where it intends to concentrate its western works. The plant will cost not less than $3,000,000 and will employ 5,000 men. It will have a capacity of about 200,000 tons annually, and occupy a mile of frontage on Lake Michigan.

HAT TRUNK.

A trunk to transport ladies' hats is the recent invention of a



Trunk for Hats.

St. Louis man. The hats are held by springs and the most industrious baggageman will not be able to injure them.

Several years ago the Kingdom of Aracaunia was offered to Andrew Carnegie for $20,000,000. It was when Achilles I was king. He sent the Count de Belligrade to Pittsburg to confer with the steel magnate. After a conference of six weeks the Pittsburger decided that the iron in Aracaunia was not worth $20,000,000, and he passed up the proposition.

WILD GEESE KILLED BY LIGHTNING.

During a thunderstorm at Zechliner, Hutte, Germany, two wild geese that were flying over in flocks, were struck by lightning and instantly killed. One of them as it fell through the air and buried itself deep in the sand, was witnessed by Leonard Joseph. On the abatement of the storm, another wild goose was found about a mile from where the first one was picked up. The only wounds upon the birds were a narrow but direct opening a little more than an inch long on the neck of the first bird and a small puncture on the neck of the other. Judged by the position in which the birds were found, their flight was in opposite directions. The wounds in each instance were instantaneously fatal. During the storm only five flashes of lightning were observed.

THE WORLD'S LARGEST PRODUCING OIL WELL.

Probably the largest producing oil well in the world, is in the Bibi-Eibat field, Russia. During the first few days it flowed 180,000 barrels a day. The well is more than 1,800 feet deep and all the best wells strucks in this district are deeper than the average struck in the older territory. This well continued flowing for thirty days during which it produced more than 2,000,000 barrels. Notwithstanding its enormous flow the owners lost money by it. During high winds the oil from the great gusher was showered over villages a mile away. It fell in such profusion for a time that the people, not knowing of the source, became frightened and declared it was raining oil. In some sections it caught fire and it was with difficulty that the town was saved from destruction. Thus very heavy damages had to be paid to property owners. Besides the well was on government land and the oil men had to pay a royalty almost equal to the selling price.

TO START A FOUR-HUNDRED-ACRE QUAIL FARM.

Indiana Man Says the Birds Are as Readily Domesticated as Chickens.

The 400-acre farm of Harley Smith in Jay County, Ind., is to be given over to the raising of quail. Mr. Smith, who has engaged in quail raising to a less extensive degree for several years, says that the quail can be domesticated and can be made decidedly more profitable than any other kind of fowls, both on account of the rapidity with which it multiplies and the little trouble and expense required to prepare the birds for market. He has raised quail by setting the eggs under a hen and bringing them up with the barnyard fowls. He says they were as gentle as the chickens and ducks. As a means of starting his industry he has not permitted a gun to be fired on his place for five years, until now the quail from the woods come around his barnyard and eat with the chickens. The land is overflowingly stocked with the birds and their nests are thick in the underbrush and fence corners. He will secure the eggs from the nests this summer and hatch them in an incubator. He will keep the females and sell only a part of the males, and he hopes to have not fewer than 1,500 egg-producing birds when the season of 1903 opens.

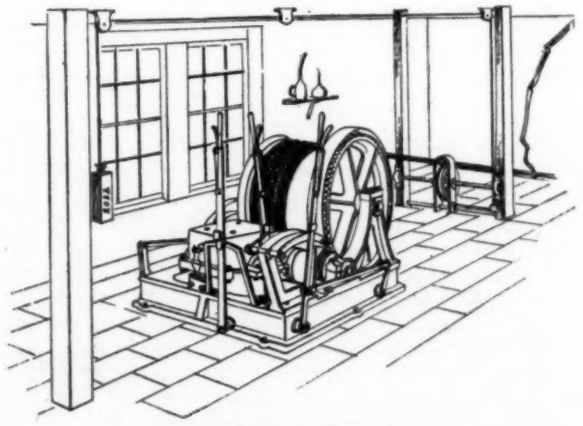
It costs Russia $6,500,000 for the support of the Czar and his family; Turkey is taxed $5,000,000 for its sovereign; Austria, $4,600,000; Prussia, $3,900,000; England, $3,075,000, and Italy, $3,080,000.

Nine cars of fresh halibut and one car of Puget Sound salmon have arrived in Boston from Vancouver, B. C. The shipment was termed the "halibut express."

A DEVICE FOR WINDING A ROPE ON DRUM PROPERLY.

A correspondent of Mines and Minerals describes a visit to a mine where he found the engineer guiding the hoisting rope onto the drum with a bar. This had been done several years and required time and attention. The correspondent "cured" the trouble and tells how it was done:

I herewith give a sketch and description of the arrangement, which consists of an ordinary sheave wheel 12 inches in diameter, working directly in front of the drum on two horizontal shafts each 1¼ inches thick. The distance from drum to wheel is 4 feet, and top of sheave wheel is 4 inches above level of bottom of drum. The rope is passed over the wheel and has a pull upward of 4 inches at that point. The wheel runs loose on the upper shaft and it is enclosed by a yoke through which both shafts are passed to prevent lateral motion. At the lower end



DEVICE FOR WINDING ROPE ON DRUM.

of the yoke a cord is attached (preferably sash weight cord) which passes around a small pulley wheel on a line with lower bar and continues up to a horizontal timber overhead, passing around three more small pulley wheels as shown. A weight of 20 pounds is attached to the end which hangs close to left hand of engineer as he stands at his levers.

When an empty trip is being pulled in, the weight is hung on small hook provided for that purpose and is taken off when loaded trip is coming out.

It must be remembered that the rope always wound in a bunch at the end which appears in side view of engine room before using our scheme, but now it winds evenly and in the right direction at all times, and if the rope should wind to left end of drum this device will work just as well by simply changing the cord and weight to the right instead of left as it now stands. We pull a trip of 70 tons and our system is head and tail line.

CONDUITS IN CITIES.

The placing of city telephone and electric light wires in conduits is growing in favor, says the Electrical Review in an editorial. The first cost is high, but repairs are small and interruptions to service are few. The demand for telephone wires is increasing very fast; provision should be made for at least twice the number of wires at present required. The trend of opinion seems to be that there is no particular danger in running both telephone and light wires in a joint conduit if separate manholes are provided, as the telephone workers are less accustomed to the high voltages of the lighting companies. There should be a distributing pole in the center of each block, placed in the rear of the buildings served. This plan would save much unnecessary opening of streets.

ONE BILLION MINUTES SINCE CHRIST WAS BORN.

Slow March of Time Contrasted With the Rapid Accumulation of a Billion Dollars.

At 10:40 a. m. April 28 exactly one billion minutes had elapsed since the birth of Christ, according to the present reckonings of the Christian church. In that time nations have come and gone, civilizations have waxed and waned, and the very formation of the earth has changed. It has taken the world reeling through space with great velocity nearly 1,902 years to unwind a billion minutes, but it took J. P. Morgan only a few hours to wind up a billion dollars. Even Mr. Carnegie could "bite his thumb" at Chronos, says the Record Herald, and at the rate of forty millions per annum not hear the faintest reverberation of a golden clank or jingle in his trousers when 25 years had elapsed. Who said that time was money?

Thus if some person could have been born at exactly the same time Christ was born and had been living through all the ages since to the present time and had accumulated a dollar every minute of his life, and had not spent a cent of his accumulations for living or any other purpose, he would just now have rolled up his first billion dollars and might claim peerage with Morgan or Schwab or Rothschilds or Rockefeller or Carnegie or some other of our present kings of commerce.

The calculations which determine this duration of time are made by Prof. Schubert of Hamburg. He figured out that at midnight of April 27, allowing for all leap years and all other corrections and eccentricities of our calendar, precisely 999,999,360 minutes had elapsed and the remaining 640 minutes necessary to complete the billion were exhausted April 28 at 10:40 a. m.

WHALE CROP FAILS—CORSETS ARE HIGHER.

Seas Scoured in Vain for the Big Fish of the Whalebone Variety, Which Will Soon Be Extinct.

A big rise in the price of corsets is imminent because of the failure of last year's whalebone crop. In fact the indications are that the crop for future years will continue to grow smaller for, like the buffalo, the whale is rapidly becoming extinct. Genuine whalebone is so scarce that it is rarely found in corsets costing less than $10 apiece.

But 28 whales were caught last year. A year ago, says the Fishing Gazette, there were 200,000 pounds of whalebone in the American market, but by Oct. 15 of that year the supply had declined to 78,500 pounds. At a recent sale the price of whalebone was quoted at $2.50 per pound, and New Bedford dealers say it will advance to $4. These and a few other facts indicate that the once important whale fishery is fast approaching the end. In 1846 the American fleet consisted of 722 vessels, with a tonnage of 331,406, and the catch of that year amounted to $21,000,900. Eight years later it had declined to $10,766,522, and in 1880 it was $2,659,725. By 1894 the United States had only 85 vessels engaged in the business, and the receipts fell to $982,009. Mineral oil and substitutes for whalebone have seriously damaged the trade, but if a new fishing ground could be discovered it would be profitable. The Antarctic seas have been explored with but poor success. In another 20 years there will probably be no whaling industry. Sea after sea has been depleted of the whalebone variety, and the San Francisco fleet is having poorer luck every year in the Arctic.

M. Lockroy, former minister of French marine says that the sub-marine boat may be detected only by a balloon or airship. Its black form under water, he says, will be easily distinguishable from a height.

Easy Electrical Experiments FOR BOYS

By L. P. Dickinson

CHAPTER XIX.

HOW TO MAKE A SET OF TELEGRAPH INSTRUMENTS.

The writer well remembers the satisfaction experienced with his first set of telegraph instruments, made at home and operated by a home-made battery. Such a set can be made with the simplest tools and with a fair amount of mechanical ingenuity, and will work admirably.

For material there will be needed for each instrument, a small quantity of pine board ⅝ inch thick, two iron bolts 3 inches long and 5-16 inch in diameter with a nut on each, a small piece of thin sheet iron and eight ounces of No. 24 double cotton covered magnet wire. The bolts mentioned are the kind used by carriage makers and carpenters. The sheet iron can be obtained by putting an old tomato can into a fire until it is melted apart, and the tin upon its surface is all melted off. This leaves the iron of which the can is made free from tin, and its surface may be cleaned with a bit of sand paper.

Take a piece of board 6½ inches long, 4 inches wide and ⅝ inch thick. This is to serve as a base board upon which the instrument is to be built. At a distance of 3⅜ inches from one end, mount an upright board 4 inches long and 2¾ inches wide. Being as long as the base board is wide, it extends completely across the latter. Before screwing it to the base board, bore two holes in it 5-16 inch in diameter, at a height of 1 inch from one edge, and 1½ inches apart. The appearance of this piece is shown in Fig. 1 at A.

Procure two bolts, of the kind previously described, and of the size mentioned. These are shown at B in Fig. 1. The head end of these bolts is usually square. Cut out of a piece of sheet iron about fifteen pieces 2⅝ inches long and 1 inch wide. Near each end cut a slot just wide enough to fit the end of the bolt just close to the head. The distance between the centers of these

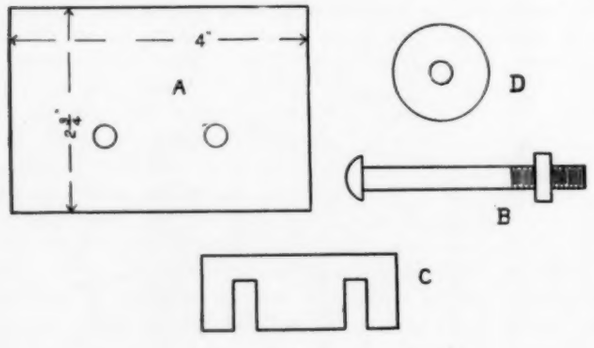


FIG. 1

slots should be 1½ inches. The cutting can be done with an old pair of shears. There should be enough of these strips to form a pile about 3-16 inch high when tightly pressed together. These are shown at C in Fig. 1.

Next cut out four circular pieces of wood, ⅛ inch thick and 1¼ inches in diameter. Through the center of each cut a hole just large enough to fit tightly upon the iron bolts. These pieces of wood are to form the heads for the spools of wire to be wound upon the bolts which are to form the cores of an electromagnet. Their appearance is shown at D in the figure.

Slip two of the circular wooden pieces upon one of the bolts. Place one of them at a distance of 3-16 inch from the head of the bolt. Place the other at such a distance that there will be 1½ inches of free space between the two. Cover the iron bolt between these pieces with a layer of heavy paper glued in place. One of the circular pieces should be kept at the proper distance from the head of the bolt by a wedge made of wood inserted between the head and the wooden piece. The position of the other circular piece can be regulated by turning the nut upon the bolt. Wind the space between these two pieces with 12

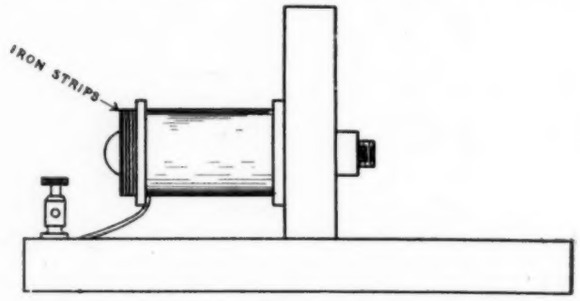


FIG. 2

layers of No. 24 double cotton covered magnet wire. Repeat this operation with the other bolt, thus forming two coils with the bolts as cores.

The strips of iron which were cut out are to connect the bolts together at the end where the heads are. Remove the temporary wooden wedges and insert the strips of iron between the heads of the bolts and the heads of the coils. Put them in first from one direction and then from the other, so that the slots will run in alternate directions. The finished magnet will then look like the one shown in Fig. 2. Now remove the nuts from the end of the bolts, using great care not to disturb the wooden heads of the spools, and insert the ends of the bolts into the holes in the upright piece first constructed. They should project through the piece about ⅜ of an inch and are clamped firmly in place by screwing the nuts up tight against the board. This will hold the coils firmly against the board, and at the same time clamp the strips of iron at the rear end of the coils very tightly together.

Fasten the piece of board with its attached magnets to the base board by screws passing up through the base board. One end of one coil of wire should be connected to one end of the other coil in such a manner that a current going around the coils will go around one magnet coil in a direction opposite to the direction in which it goes around the other. Connect the free ends to two binding posts. The appearance of the apparatus as thus far constructed is shown in Fig. 2. In the next chapter we shall see how to complete the instrument.

[The telegraph instrument described in this series, which will extend through three issues, can be operated on a line a mile long by using sufficient battery. For a short line of a few hundred feet small battery power will suffice. "How to Construct Dry Batteries" will follow.—Editor P. M.]

"WE ENJOY YOUR PAPER."

Prof. M. E. Valentine, Superintendent of Schools, Columbiaville, Mich., writes:

"We enjoy your paper. My class in electricity gain many valuable points. Will you please in the near future explain how to make a dry battery? Thanking you in advance for the kindness, I am, yours for the success of Popular Mechanics."

[The article on dry batteries will appear May 31.—Editor.]

Shortage of skilled help in the manufacture of furniture has caused a big increase in wages paid to the better classs of workmen. This is not through any organization or union, but through a constant tendency of the manufacturers to bid against each other for good workmen.

Fig. 1—Cantilever Bridge for the Wabash R. R. Across the Monongahela River at Pittsburgh; length of Main Span 812 Feet.

TWO OF THE LARGEST BRIDGES IN AMERICA.

Massive Spans Being Built by the Wabash—Tunnel 4,450 Feet Long.

Two of the largest bridges in America are being built by the Wabash railroad company to span the Monongahela river at Pittsburg and the Ohio river at Mingo Junction. They are of the cantilever type, says the Railway Review, and mark another advancement in American bridge building. Both structures are double track.

The center span of the Monongahela bridge is 812 feet long with 346 feet anchor arms. The central towers are 126 feet high and the depth of the suspended span is 60 feet. The massive piers are 70 feet above high water. They are 22 feet thick at the neck with a center section hollowed out. They are of concrete ashlar faced with sandstone.

Two enormous tunnels, one 4,450 feet long and the other 3,250 feet, are included in the 60 miles of continuous heavy work made necessary by the road's entry into Pittsburg. The former tunnel is at Greentree Burrough and the other under Mount Washington. A steel viaduct will be used for the approaches which carry the tracks to the depot and from the bridge across the Panhandle and Pittsburg & Lake Erie tracks to Mount Washington.

The Ohio river bridge will be similar to the Monongahela structure. Its anchor arms will be 290 feet long. The bridge affords a clearance of 90 feet above low water. All piers are carried down to rock with pneumatic caissons.

FRENCH WRITING MACHINE FOR THE BLIND.

A machine which enables a blind person to write as he reads, from the left to right, has been invented in Paris. The writer can thus correct as he writes without displacing the paper. He has but one alphabet to learn, which he can acquire in six lessons. The machine is composed of a metal frame with a movable copper reglet, which slides across the frame. A pointed instrument presses on small mobile keys, which are hollow, and in their turn press on raised metal points. The characters formed are thus in relief on the side of the writer, who can verify his writing without displacing the paper. The machine also enables the blind to calculate arithmetically. It may be folded and carried in the pocket.

C. F. Bishop and his wife. Americans, while riding in an automobile through the Posilippo tunnel in Italy, were set upon by peasants and severely beaten with clubs.

TO JUDGE A RIVER'S BREADTH.

It is necessary to make use only of the eyes and the brim of a hat to measure the width of any ordinary stream, or even of a good-sized river, and here is the way to do it, says the Marine Journal.

Select a part of the river bank where the grounds run back level, and, standing at the water's edge, fix your eyes on the opposite bank. Now, move your hat down over your brow until the edge of the brim is exactly on a line with the water-line on the other side. This will give you a visual angle that may be used on any level surface, and if, as has been suggested, the ground on your side of the river be flat, you may "lay off" a corresponding distance on it. To do this you have only to hold your head perfectly steady, after getting the angle with your hat brim, supporting your chin with your hand, if necessary, and turn slowly around until your back is toward the river. Now, take careful note of where your hat brim cuts the level surface of the ground as you look over the latter, and from where you stand to that point will be the width of the river—a distance that may readily be measured by stepping. If you are careful in all these details you can come within a few feet of the river's width.

RUSH FOR GOLD TO THUNDER MOUNTAIN.

There is a great rush of gold seekers to the Thunder mountain district of Idaho. Tales of fabulous strikes, both placer and quartz, come back to civilization from this land of gold, which is about 200 miles north of Boise and far away from any railroad. At present flour is selling for $50 a barrel and food of all kinds is very scarce. During May and June when the trails are free from snow and even greater rush is expected to this miners mecca. From Boise and other railroad points nearest the new camp, big parties will set out and by the middle of June it is estimated that 30,000 men will be in the district. Reports from the camp indicate that there is great difference in the ore and that most of it will be valuable only when worked by costly machinery. Col. Dewey, of Nampa, Idaho, is said to own the richest claim in the district.

The American Steel and Wire Company of New York has been awarded the contract for furnishing 3,343,000 feet of copper wire for the electrical power circuit of the world's fair. The contract price is $200,000.

A machinery insurance which provides an indemnity against the loss of time from stoppage due to breakage or other similar causes except fire, is being given a trial in New England.

Fig. 2—Cantilever Bridge for the Wabash Railroad Across the Ohio River at Mingo Junction, Ohio; Length of Main Span 700 Feet.

Popular Mechanics

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POPULAR MECHANICS

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LOCOMOTIVE AND FIRE ENGINE COMBINED.

A combination switch engine and fire engine is a novel contrivance that has worked with remarkable success in the yards at the Port Tampa terminal of the Plant system. The switch engine is equipped with a fire pump located on the rear of the tender. When a fire breaks out the engine utters a shrick and

Locomotive with Fire Pumps.

starts out at a speed that leaves all other fire engines far in the rear. It is generally in the act of quenching the blaze while the horses of the regulation fire engines are struggling along over the pavements. The Railway Review says:

"The operation of the pump is through a 5-inch suction hose and a 2½-inch force pipe with hose connections. As the engine can be run to any fire that could happen on either of the piers, the protection of the property against fire is thus seen to be well provided for."

"Continue to cook well, attend well to your sauces, and they will reflect honor upon you and redound to the national prosperity."—Extract from the speech of President Loubet to the assembled cooks at the culinary show at Paris.

WHAT'S THE USE OF EATING MEAT?

Cereals, Fruits, Nuts and Vegetables Better, Healthier and Cheaper.

There is no use in eating meat anyhow, declare many people who have subsisted without it for years and thrived. Cereals and nuts have all the ingredients of meats requisite to the sustenance of the human body. Besides they are healthier in that they contain fewer of the elements of disease and less waste; that is, one does not have to eat such a great quantity of the food to obtain the necessary nourishment.

There are nearly twice the amount of life-sustaining qualities in cereals that there are in the same quantity of meat. Foods that contain every element of meat and are much healthier are found in Indian corn, wheat, oats, rye, rice, etc. Nuts of all kinds are far healthier and much cheaper than meat at the rate it is selling now. There is more nourishment in a half cup of nut kernels than in a double extra porterhouse that might cost from $1 to $4 in a restaurant. And then the system is not overburdened in digesting the nuts as in the case of the steak, in which the system has to separate the 75 per cent of useless matter from the 25 per cent of real nourishment. In nuts only about 5 per cent is waste and not more than 10 per cent in cooked cereals. If eaten raw the cereals would contain 95 per cent real nourishment.

Then there are all kinds of fruits, delightful to the taste, healthful and nourishing, and cheap. Especially are the fruits commendable in springtime and summer. Far better are they than spring medicines.

Yes, a person may live on the very best of the land, enjoy better health than he has ever known before, take greater pleasure in his meals and reduce the cost of living to less than half what it has formerly cost him if he will entirely dispense with the use of meat. Here are a few of the luxuries that might grace his table:

Apples, oranges, bananas, pineapples, peaches, plums, grapefruit, berries of all kinds, musk-melons, water-melons, dried fruits, such as prunes, apples, peaches, rasins, figs, apricots, etc.; nuts, such as almonds, peanuts, pecans, walnuts, butternuts, hazelnuts, chestnuts, cocoanuts and countless others; and then there is honey, milk, eggs, butter, cheese, etc.

And with all we forgot to mention vegetables—the product of the truck garden.

Louisiana has the greatest percentage of illiteracy of any state in the Union. In that state 122,638 males 21 years of age and over, or 37.6 per cent, are unable to read and write. The next most ignorant states are: Hawaii, with 34.4 per cent illiteracy; Mississippi, with 33.8 per cent; Alabama, with 33.7 per cent; Georgia, with 31.6 per cent; North Carolina, with 29.4 per cent, and New Mexico, with 28.3 per cent. The most enlightened states are: Nebraska, with but 2.5 per cent illiteracy; Iowa, with 2.7 per cent, and Kansas, with 3.4 per cent. The most illiterate great city is New York, with 6.5 per cent, and the most enlightened Boston, with 4 per cent of illiteracy.

Small Boy (proudly to male parent)—"Father, why am I like George Washington?"

Male Parent—"Because, my darling boy, you have never told a lie."

Small Boy—"No, father. It is because I have just cut down that new cherry tree that you planted last spring."

Male Parent—"But you are unlike the illustrious George, my son, inasmuch as his father said to him, 'Come to my arms, my darling boy,' while your father is now going to escort you to the wood shed and tan your hide till the frightened neighbors will hear your anguished shrieks for five blocks."

LOCOMOTIVES OF A CENTURY

[Being an illustrated history of locomotive invention, building and progress. The facts are taken from a paper by S. M. Vauclain, read before the New England Railroad Club. The illustrations were gathered and engraved by the Baldwin Locomotive Works, by whose permission they are used.—Editor P. M.]

We now come to a period of locomotive building—1853 to 1861—that ended with serious interruption in its former rapid progress because of the civil war. Five years of comparative inactivity followed but after this lull was over the progress was greater than ever before. It was continued steadily since until now the American locomotive threatens to revolutionize the railway transportation of the world.

Fig. 26—Rogers' Locomotive with Wagon Top Boiler, 1855.

In 1853 Mr. Baldwin abandoned the half-stroke cut-off he had used since 1845 and introduced his variable cut-off. His opposition to the Stephenson link was enduring and not until the pressure of his associates was brought to bear did he consent to its adoption. The plan of casting the cylinders with a half saddle was introduced by Mr. Baldwin and naturally so, because his inclined cylinders were bolted to a circular smoke box, and as the cylinders were lowered to the horizontal the saddle assumed its present shape.

In 1855 Norris built the Phleger boiler (Fig. 26) which was one of the early improvements in the regular locomotive boiler. The first attempt to introduce water tube boilers, reversing the order of things and passing the water through the tubes, was

Fig. 27—Norris' Locomotive with Phleger Boiler, 1855.

made by Dimpfel about the same period. Many of these were built by Mr. Baldwin and ultimately abandoned on account of the amount of repairs necessary, many tubes having to be removed to get at any one which might be defective.

The most notable example of the many attempts to provide a locomotive boiler of the wagon-top type is found in the "Madison," (Fig. 27) built by Rogers.

In 1861 the "Mogul" locomotive appeared. It was built by

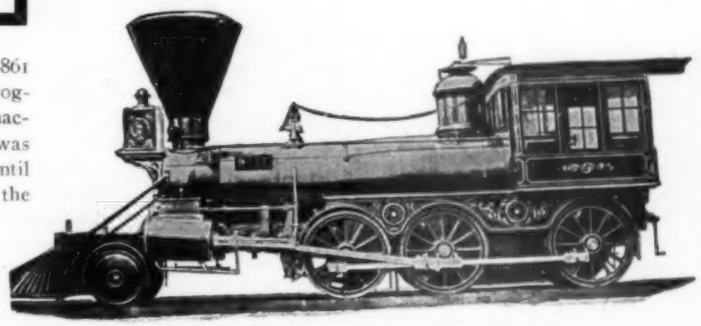


Fig. 28—Baldwin Mogul, 1861.

the Baldwin Locomotive Works for the Louisville & Nashville railroad. This locomotive (Fig. 28) is undoubtedly the first "Mogul" with a flexible truck. It is a ten-wheel design with

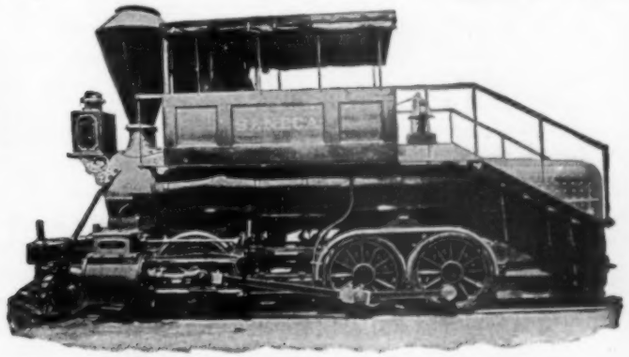


Fig. 29—Locomotive "Seneca," Reconstructed.

a two-wheel sliding Bissell truck in front of the cylinders. John P. Laird, at Altoona, on the Pennsylvania Railroad, converted a number of the Camel engines on that line into Moguls. He even went so far on the old "Seneca" (Fig. 29) as to omit the second pair of drivers and add the truck.

PUMP OIL WITH GASOLINE MOTIVE POWER.

In a test of the new gasoline oil-pumping plant installed in the state lunatic asylum at Austin, Tex., the contents of two full loaded oil cars were forced through the pipe from the railroad tracks to the asylum, 6,700 feet, in two hours. Ten gallons of gasoline, costing $1.35 (a very high price for gasoline), were used. Each car contained 3,200 gallons. The capitol is on a hill, which made the work more difficult.

"One gallon of gasoline," says the Age of Steel, "costing 13½ cents was used in moving 540 gallons (16 barrels) of oil a distance of more than a mile and a quarter up hill." In addition there was an immense saving as compared with the former system of drayage and a much more expeditious and satisfactory handling of the oil. In draying by tank wagons it is impossible to fill the tanks to their full holding capacity.

The Tower Hill hotel of Tower Hall, R. I., with ten acres of land and four cottages has been donated by Gordon Mackay of Newport for a manual training school for colored children. Booker T. Washington, Mr. Holly of Philadelphia, and Dr. Buchanan of New York will be trustees.

THE MICROSCOPE AS A LIFE SAVER.

It Reveals the Great Army of Disease Germs Waging War with the Cells of the Human Body.

The most valuable mechanism in saving life and warding off disease is the compound microscope. What the compass is to

Showing Germs of Consumption. (highly magnified.)

the mariner, the Bible to the preacher, this wonderful instrument is to the physician. It is combination of lenses which makes the minute world visible. If we could wear these microscopes like spectacles we could avoid the poisonous bacteria just as we avoid the poison ivy. As it is we only suspect their presence when the tissues be-

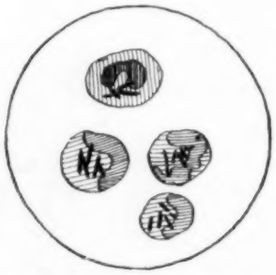
Showing Germs of Carbuncles. (highly magnified.)

come inflamed and then an examination will reveal the invading germ.

By means of the microscope we find that the cell is the essential element of life. Bacteria are cells and the plants and animals are composed of cells essentially the same as those of the disease germs. The cells in plants and animals are bound together while those of disease are separate.

Showing Germs of Lock Jaw. (highly magnified.)

Disease germs are living organisms that float in the air, cling to food and clothing and thus drift about till they come to suitable conditions for them to multiply. The cells of the human organism are always at war with the germs with which they are continually in contact. In this battle with the human cells as long as they are strong



Blood Cells Eating up Bacteria.

and the person is young, diseased germs can get no foothold. But when the cells are injured or weakened by lack of nutrition or approaching age then the vigorous bacteria can invade the organism. Thus in the end the bacteria most often win. As soon as the germs find a weak spot and begin to invade the organism a battle is on. The blood rushes to the spot a certain cell that has the ability of eating up the invading germs. The tissues that are invaded swell and prevent the germs from spreading; the entire cells of the body secrete antitoxin that counteracts the poisons of the germs.

It is the lazy or impaired cells that are invaded. A collar button may chafe the neck so that the germs of the skin can penetrate and cause a carbuncle. The tubercular bacilli find the weak lung cells of the book keeper easy to overcome and they get busy and it is good-bye book keeper.

RIVER YACHTSMEN ORGANIZE.

The Mississippi Valley Yachting Association is being organized by the owners of pleasure boats along the great river between St. Paul and St. Louis. The organization is to be the central body of the various yacht clubs now being formed along the Mississippi.

A NOBLE SENTIMENT.

In an address to a grand jury in 1796 Chief Justice Ellsworth said:

"So let us rear an empire sacred to the rights of men; and commend a government of reason to the nations of the earth."

REGRETS NOAH USE.

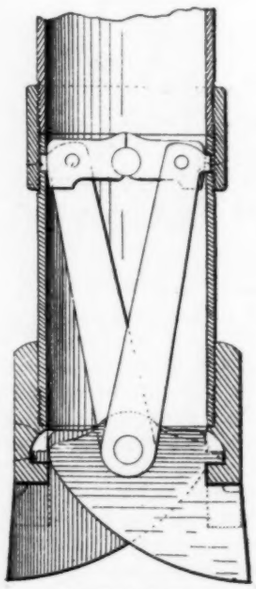
"This is tough luck," said Ham, mournfully, as he leaned over the side of the ark. "What's wrong now?" queried Shem. "Why, all this water to fish in," replied Ham, "and only two worms on board."

TEN MILE TRIP UNDER THE SEA.

The submarine torpedo boat Fulton made a ten-mile trip under water from Sandy Hook down the Jersey coast on its way to Washington, it being the first ocean voyage ever made by a submarine vessel. It was 30 feet under water most of the time. The trip to Washington was marred by an explosion of the gasoline engine which injured five men. The boat, however, was not seriously impaired. The boat was built at the Morse Shipyard, Brooklyn.

BIT FOR DRILLING WELLS.

The sinking of hundreds of oil wells, some of them to great depth, in Texas, has led to the invention by a Corsicana man of a new rotary drill illustrated herewith. The



Oil Well Drill.

bit is attached to the lower end of the pipe and revolves when the pipe is turned.

GREAT IS THE APPLE.

Everybody ought to know that the very best thing he can do is to eat apples just before going to bed, says the People's Health Journal. The apple is excellent brain food, because it has more phosphoric acid, in an easily digested shape, than any other fruit known. It excites the action of the liver, promotes sound and healthy sleep and thoroughly disinfects the mouth. It also agglutinates the surplus acids of the stomach, helps the kidney secretion, and prevents calculus growth, while it obviates indigestion, and is one of the best preventives of diseases of the throat. Next to lemon and orange, it is also the best antidote for the craving of persons addicted to the alcohol and opium habit.

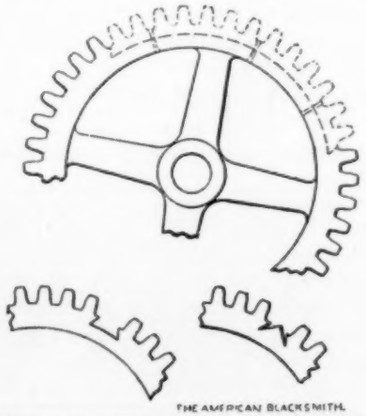
SHOP NOTES

REPAIRING BROKEN COG WHEELS.

It takes a skilled workman to mend a broken cog wheel and do it properly. A writer in the American Blacksmith tells how he repaired one:

Now it does not do to dovetail cogs when several are broken in the casting, side by side, as there is not metal enough left to hold them, so the only possible way is to make one continuous plate with the requisite number of cogs on it, and fit it in the body of the wheel by chiseling enough off the casting to allow a plate, in this case ½ by three inches with thirteen cogs on it, to fit in the space thus made. I dovetailed the ends of plate and in addition put three rivets through the plate and flange, and that was all that was required to hold it there firmly. To make the plate and cogs I proceeed as follows: I took a plate of Norway iron of the required length, forged the requisite number of cogs, punching a hole through each one and riveting them to the plate the proper distance apart. Then I took a welding heat on part of them and continued until all were welded on. I next shaped the plate to the curve of the wheel and fastened on as stated above. The figure will show the way the job was done.

In a break of only two cogs, dove-tailing will be sufficient, but for three or more it is better to fasten with an additional rivet besides the dovetailing, making the whole of one piece. In the case of a single cog, when the rim is of sufficient thickness to stand a chiseled notch, a dovetailed cog inserted will



THE AMERICAN BLACKSMITH.

METHOD OF REPAIRING BROKEN COG WHEELS.

be all that is required. In preparing a wheel for a cog to be inserted make the notch first. If the rim is heavy, use sharp chisels and start as shown in the illustration. Then with a narrow chisel cut out the center and dovetail on both sides, after which fit in the cog so that it will drive in reasonably tight, and if necessary clinch on top and bottom in the dovetailed part. In smaller cog wheels where the rim is too light to admit of chiseling, the file must be substituted to make the notch, and the cog after fastening slightly can be brazed on, but great care must be exercised or the wheel will be melted up before the spelter fuses.

In the case of bevel gearings, a broken cog is harder to insert on account of the thinness of rim not giving or leaving enough metal to admit of sufficient notching to hold the cog securely. In that case I first rivet a plate across the part where the cog is to be inserted on the under side parallel with the wheel, thereby strengthening the same, so that it will stand having a good dovetailed notch filed in it. I rivet the inserted cog on top and bottom after it is driven in place.

Sometimes the wheels are very greasy, and in that case the burning of the greasy matter on the forge is first necessary before the article can be handled. In doing that, however, care must be taken that the wheel is heated all over in an even manner or a bursted rim will be the result.

HOW TO MAKE A WOODEN PULLEY.

In case of emergency it is possible to build a fairly good wooden pulley of inch boards. Small pulleys can be cut out of a single block, split with the saw and bolted over the shaft.

Set the pulley on the shaft, start up the engine and then turn the face of the pulley to a true circle, with the center crowning so as to hold the belt.

A NEW PAINT FOR IRON.

Mr. M. Toch of the New York Society of Chemical Industry gives the following receipt for paint for iron, which he says will outwear red lead:

Seventy per cent of barytes; 10 per cent of carbon black; 10 per cent of zinc oxide and 10 per cent of graphite ground in pure linseed oil containing a sufficient quantity of driers.

If this paint and the red lead both be painted over a rusty surface, says Mr. Toch, the scales of rust will break through the red lead more quickly than they will through the black paint containing barytes.

HOW TO WORK STEEL INTO TOOLS.

A blacksmith, successful in working steel into tools, thus describes his method in the Mining and Scientific Press: The steel is worked at an orange heat during the forging. When shaped, the next step is refining. This is done by hammering in water. A little water is put on the anvil and the face of the hammer is wetted. The steel must be at nearly red heat when this is done. The refining is repeated by reheating several times. After finishing this, the steel is heated to a dark red, so that it just shows the color, and dipped in raw linseed oil. The tool is reheated and dipped three times. The fourth time the reheat is carried to an orange color and dipped in the oil until nearly cold. The oil is then wiped off and the metal polished, care being taken not to break while polishing, as the metal is extremely hard. A large piece of iron is then heated to a red heat. The tool is laid on this with the heavy side down to draw whatever color is desired, different tools requiring different colors.

MULE POWER—MARK TWAIN ENGINEER.

Samuel L. Clemens (Mark Twain) once worked on the Mississippi river boat Swallow, serving in the capacity of pilot and "engineer." Captain Thomas Bixby, under whom he served, says:

"The craft was a little, shaky affair, which plied between St. Louis and Cairo. It had a stern wheel, a place for freight and passengers, a pilot house and a place on what may be called the pilot deck for the engine. That 'engine' went aboard when it was needed, and only then. It burned no wood or coal, but ate a powerful sight of grass. It was a large, gray mule, named Jerry, which worked a tread-mill that propelled the boat. Samuel Clemens was chief engineer and pilot. He had a system of signals which was effective and ingenious. By pulling a cord he could raise a head of cabbage just out of reach of the mule. The 'engine' would start and begin to walk after it, and the boat floated majestically down or up the river, as the case might be. Without desiring to be personal, I will say that Jerry was one of the most intelligent animals I ever met. His voice was more on the order of a foghorn than a whistle, being too much of a baritone for the latter. When Samuel wanted to whistle for a landing he just hit Jerry with a stick."

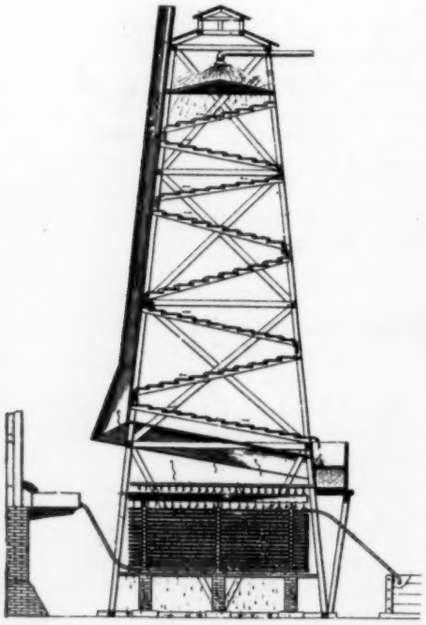
FAST AS A RAILWAY TRAIN.

J. E. Wing, in an automobile on Long Island, N. Y., made 105 miles in 2 hours and 20 minutes. It was the fastest 105 miles ever covered in this country by a gasoline automobile. Part of the time the automobile went at the rate of a mile in 55 seconds. Other miles were made in 57 seconds and 58 seconds and many were made at the rate of a mile a minute.

The census of dogs, just taken in France, fixes the number in the country at 3,000,000, from the tax of which the government derived a revenue of $1,675,000.

WATER COOLING TOWER.

Among the recent inventions for cooling the water used by condensing engines is one built as a tower. The water is delivered at the top in spray and descends over



Water Cooling Tower.

a series of steps, making the distance traveled as long as possible, with corresponding exposure to the air. The receiving tank at the bottom is kept cool by a current of air set in motion by a stack which extends to the top of the tower.

A $2,500 BEEFSTEAK PUDDING.

Charles M. Schwab will soon treat his millionaire friends to a $2,500 beefsteak pudding which he has ordered in Fleet street, London. The cost of the pudding includes the traveling expenses of Proprietor Moore of "Ancient Cheshire Cheese," where the pudding is being made, to the United States.

The Hotel World says: The pudding will consist of 100 larks, 100 kidneys, 100 oysters, one for each of the 100 millionaires whom Schwab has invited to be present. It requires 20 hours to boil the "Cheshire cheese" pudding. It will be boiled ten hours in London and another ten hours prepartory to being served in the United States.

A MOVING EPISODE.

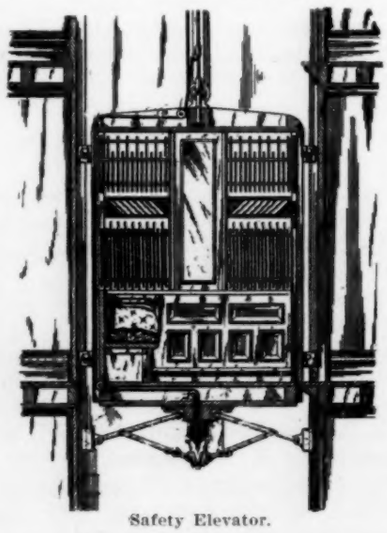
A youth went forth to serenade,
The lady he loved best,
And by her house at evening,
When the sun had gone to rest,
He warbled until daylight,
And would have warbled more,
But morning light disclosed the sign
"To Let" upon the door.

CAN A BULLFROG CATCH A BIRD?

Can a bullfrog catch a bird? This is the question that is worrying American ornithologists. Some of them answer yes, because the Rev. William J. Long, a distinguished clergyman, says so, and surely a clergyman would not tell a falsehood. The divine has written a book in which he tells a lengthy story of how the batrachian caught a swallow as it was flying over the water and a day or two afterward captured a tree sparrow that was taking a bath at the water's edge. The ornithologists have met and discussed the matter; they have engaged in extensive researches but have failed to find another account of an instance of a bull frog or any other kind of a frog turning fowler The opponents of the Rev. Long do not charge him with telling things that are not true. They only say that his sight was faulty. Black snakes, cats, bad boys, sportsmen, milliners, muskalonge and mud turtles, are known to be enemies of the birds, says E. B. Clark, but the 30 odd Audubon societies in the United States, before getting out any more tracts, will anxiously await proof positive that to the list of bird destroyers they must add the bullfrog.

SAFETY DEVICE FOR ELEVATORS.

This safety device for passenger elevators is attached to the bottom of the car and as long as the cables supporting the ele-



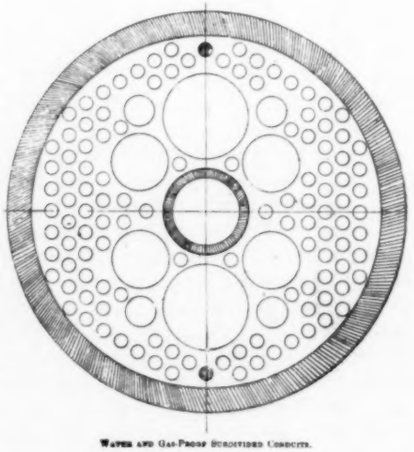
Safety Elevator.

vator do their work the device is inoperative. Should the ropes part the brake-levers are released and the brake-shoes are tightly wedged against the side-guides and bring the car to a stop.

Prince Henry, while in America, said to Admiral Evans: "What an extraordinary way of entertaining one's guest, to sit him down and make speeches at him. There is no chance for conversation."

WATER AND GAS PROOF SUBDIVIDED CONDUIT.

A conduit to contain telegraph, telephone, electric light and feeder wires of trolley is described in the Electrical Review. Re-



Water and Gas-Proof Subdivided Conduits.

ferring to the illustration the duct is subdivided into small tubes of four dimensions. The smallest is intended for the use of telegraph wires, the next larger for trolley feeder wires, the ones next larger to these for electric light wires, while the largest is intended for telephone cables. The conduit is intended to be gas and water proof.

WHEN TRANSVAAL TRADE IS RESUMED.

Refugees are returning to the Transvaal and a revival of trade is soon expected. When this is realized it is estimated that nearly $250,000,000 worth of gold will be taken yearly from the limited district bounded by the Randfontein and Geduld mines and that nearly $15,000,000 will be expended annually for machinery.

BRITISH TRAIN MEETS DISASTER.

Two persons were killed, 16 seriously hurt, and 100 slightly injured in a recent wreck on the Great Eastern Railway at Hackney Downs Junction, England. "The last threepenny train from Walthamstow" was crossing a bridge when an axle on the locomotive broke. Several of the carriages were wrecked and some of them tilted dangerously over the viaduct.

Aluminum fire hats have been made the universal head-gear of the Ottawa, Ont., fire department.

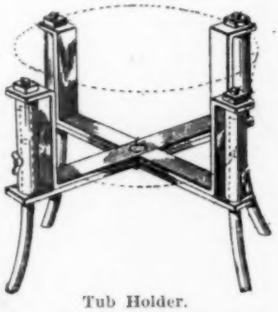
Popular Mechanics is the medium of the inventors.

Secretary of Agriculture Hamilton is making a scientific war on the Hessian fly in Pennsylvania.

FOR THE MADAM

IMPROVED WASHTUB HOLDER.

An inventor in Montana has invented a stand for washtubs. This stand is adjust-

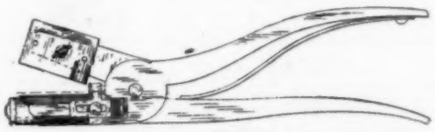


Tub Holder.

able to the size of the tub, and when not in use the legs, cross braces and side supports can be removed and folded to occupy a small space.

BUTTONHOLE CUTTER.

This device operates in a manner similar to a conductor's punch, taking out a large or small amount of cloth as desired. By

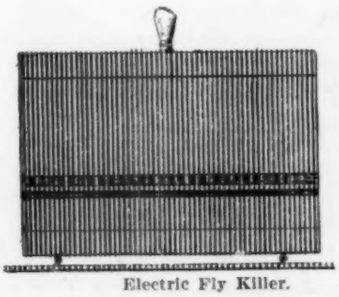


Button Hole Punch

using different cutting dies any shaped hole may be made. The holes are rapidly made and each of an exact size and shape.

ELECTRICAL FLY TRAP.

A new fly and insect killer shown here consists of pairs of parallel wires, one hav-



Electric Fly Killer.

ing a positive, the other a negative current of electricity. The trap is laid or hung over some bait. When the insect alights it receives a deadly shock.

The Brooklyn, Admiral Schley's flagship during the battle of Santiago, has returned from the Philippines and is now at the Brooklyn navy yard. The "three-horned devil" has made 60,000 miles since leaving New York, Oct. 6, 1899.

Southern Train Running on Submerged Track.

FOR AMATEUR PHOTOGRAPHERS.

A correspondent of the Photo-Beacon says: I often read that photographers dislike using pyro on account of its staining the fingers, so wish to tell you that all stain from pyro is easily removed by using a fresh-cut lemon. Rub the fingers well with the juice. I take the opportunity of telling you this because I think many would like to know it.

PREVENTS DRIP FROM TROLLEY.

During a rain storm water collects upon the trolley wire of electric lines, and as the car travels rapidly along the trolley wheel

TROLLEY WATER SHED.

gathers the water, which runs down the trolley rope. This has proved a great annoyance. The device we illustrate diverts the water and prevents its running down the rope.

Sergeant Julius Frederick, of the United States weather bureau, at Indianapolis, Ind., a survivor of the Greely expedition, has entered into a contract with William McDonnell, of the McDonnell Odometer Company, of Chicago, to make an effort to reach the North pole in an airship.

TRAIN PLOWS THOUGH RAGING TORRENT.

A train plowing its way through a surging river of water along a track submerged so that no one can see whether it has been washed away ten feet ahead, is an ordeal that is somewhat trying on the nerves of an engineer and is not extremely relished by the passengers. Such experiences, however, were common in the South during the recent heavy spring rains, the terrors of which were mentioned in Popular Mechanics last week. The accompanying illustration shows a train on the Charleston & Western Carolina railroad, making its way along a submerged track into Augusta, Ga. In describing the extent of the damage Dixie says: "Not only were the tracks under water for miles in the lowlands, but, in many places, washed completely away, rendering the operation of trains exceedingly hazardous. On account of this danger, therefore, many roads annulled trains for an indefinite time. In some cases it was several days before traffic could be resumed."

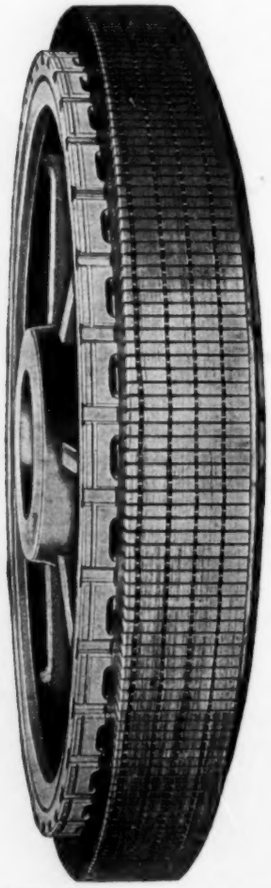
On many Southern roads engines of special construction are used, with high fireboxes to prevent high water from extinguishing the fires and stopping the train.

In the archaic vase room of the British Museum any one can gaze upon babies' feeding-bottles of sun-baked clay which were antique when Joseph went into Egypt.

George C. Tilyou, of Atlantic City, N. J., has offered $50,000 if the hotel men will raise $50,000 more to have Santos Dumont race his flying machine at Atlantic City against all American competitors.

A ROTATING ARMATURE.

The illustration shows a partially completed core for a rotating armature it is one of the large types being built at the works of the Westinghouse company. The armature winding consists of wire, strap or bars, depending somewhat on the current to be carried. Wire winding, which is usually employed in high voltage alternators of low current capacity, consists of machine wound coils which are entirely formed and insulated before being placed in the armature slots. Strap winding is



Partially Built for a Rotating Armature.

used for alternators of lower voltage and greater current capacity, and it consists of copper strap forged into the required shape and carefully insulated. Both the wire and strap windings are placed in the slots without any mechanical bending, thus preventing damage to the insulation. These windings are secured in the open slots by wedges of hard fiber.

Bar windings are held in place by the overhanging tips of the teeth; the bars after being carefully insulated are slipped into the slots from one end of the armature. The end connections of the bar winding are secured to the bars after the conductors are in place.

In some armatures there are two bars in each slot, in other cases there is but one bar per slot. There are no band wires on the armature. Any part of the winding may be easily and quickly removed if necessary.

FIRST BEAUTY STRIKE ON RECORD.

Girls Walk Out Because Employers Deny Them Time to Primp.

Women employed in the Vesta mills at Providence, R. I., have gone on a strike because their employers will not concede them time enough to make themselves look pretty. They have been accustomed to quit work at 5:15 p. m. so that they would have three-quarters of an hour in which to clean up and array themselves for facing the public before leaving the gate at 6 o'clock. The employers notified the women that they would have to work until 6 o'clock. The women sought to compromise on half an hour, then on fifteen minutes, and finally on ten minutes, and when this was denied them they struck. The Tribune says:

"Thus the first beauty strike in this country goes on record. That the women will win is quite certain for to be well dressed and look pretty is the crowning ambition of women, whether she works in the Vesta mills and lives in a cottage or does not work at all and lives in a palace. That she will accomplish it is as sure as anything can be and it is useless for man to oppose it. Indeed he would be the first one to regret it if he succeeded."

Deflection in the compasses due to the magnetic influence of the iron ore deposits along the north shore of the lake is declared by mariners to have caused the wreck of the steamer Tampa and the schooner Aurora in Lake Superior.

TO BUILD LARGEST WARSHIPS AFLOAT.

An appropriation of $76,000,000 for the construction of six new war ships has been recommended by the house naval committee. Two of the vessels are to be battleships of 16,000 tons displacement to cost, exclusive of armor and armament, $4,212,000 each; two, armored cruisers of 14,500 tons displacement each, to cost, exclusive of armor and armament, $4,659,000 each; two gunboats of 1,000 tons displacement, to cost $382,000 each. The warships will be the largest afloat.

It cost Chicago $22,500 to entertain Prince Henry during his two day's sojourn in the Windy City.

J. E. Koch, a jeweler of York, Pa., found $15,000 in an old chest which he purchased for a trifle at an auction sale.

In England no person who is known to be engaged in the retail trade can be admitted to court or presented to the sovereign.

A moving stairway operated by electricity has been installed in a department store in Chicago.

Lord Kelvin, while in New York, said of wireless telegraphy: "The new agency will supplement the old one. It will not supplant it. In fact, by popularizing transoceanic telegraphy it may even benefit it."

Grant Nickerson, of Barnstable, Mass., recently dug up a clam that was 7 inches long, 4 inches wide and weighed 1 pound 5 ounces.

Two forest reserves, one of 86,000 acres and the other 126,000 acres, will be established by the government in the sand-hill district of Nebraska.

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WHEN OUR SHIP COMES IN.

A little child dwelt by the flowing sea,
And her home was the home of poverty;
She ran with bare feet o'er the golden sands,
And gathered shells with her small brown hands.

Gay strangers came in their rich robes bright,
But the little maiden shunned their sight;
And shaking her curls o'er her blushing face
Sped away like a fawn that flees the chase.

When the strangers were gone, said the mother mild,
"What was it dismayed thee, my darling child?"
"Oh mother, my feet were bare and brown,
I had no bonnet—and then—this gown."

She held up the skirt of her faded frock,
Sadly rent by the jagged rock,
And she said with a deep and long-drawn sigh,
"Will I have such dresses as they by and by?"

Her mother smiled with a grave sweet face,
As she smoothed the curls from the half-grieved face,
And said, "When our ship comes in from sea
You shall have garments and all things free."

"When our ship comes in," cried the little one,
And away to the highest rock she run.
And watched till night-shadows dimmed the shore,
For the freighted ship and its treasured store.

Long and often she watched in vain,
No ship for her sailed over the main;
How many watchers in life there be
For the ship that never comes over the sea.

—Boston Transcript.

A LEGLESS SKATER.

The illustration is made from a photograph taken the past winter of a skater who had lost the lower portion of both legs. He was injured in a railroad wreck

A Legless Skater.

and an amputation of both lower limbs was made five inches below the knee. So perfect has the construction of artificial limbs become he is still able to indulge in his favorite sport—skating.

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Attractions for Next Week.

Because Lillian Russell is a subscriber and constant reader of Popular Mechanics, her joking friends now call her "the melodious mechanic." But this woman of perpetual youth has discovered that others of her calling like to read Popular Mechanics, too. "Every time I lay the magazine down," she says, "somebody slips it away and then they make out that I am the only one in the company who reads it. I read Popular Mechanics because I find so many things in it that are interesting and of help to me It is the only one of those kind of papers that I can understand."

Lillian is right. There are many people of other callings who like to read Popular Mechanics quite as well as those in the mechanical profession.

Would you like to know how the island on which Robinson Crusoe had his immortalized experiences looks to-day? It abounds in delicious fruits and vegetables which grow wild, and the waters are filled with fishes, including the finest lobsters. You ought to read about it next week.

You will also probably want to know about how "paper money" is made. We cannot tell you exactly, of course, but we will do the best we can next week. It is easy to get rid of mosquitoes when you know how; the "prescription" is in the next issue. The next issue will also tell about a proposed new law to protect factory girls from dangerous machines; about how a county has grown wealthy from planting and raising oysters; the highest salaried mail carrier in the world; a professor who says that kissing is no harm and a half a hundred other things all interesting and instructive. Popular Mechanics is a paper for everybody.

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